

NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

RIPARIAN FOREST BUFFER

(Acre)

CODE 391

DEFINITION

An area of predominantly trees and/or shrubs located adjacent to and up-gradient from watercourses or water bodies.

PURPOSES

- Create shade to lower water temperatures to improve habitat for aquatic organisms.
- Provide a source of detritus and large woody debris for aquatic and terrestrial organisms.
- Create wildlife habitat and establish wildlife corridors.
- Reduce excess amounts of sediment, organic material, nutrients and pesticides in surface runoff and reduce excess nutrients and other chemicals in shallow ground water flow.
- Provide a harvestable crop of timber, fiber, forage, fruit, or other crops consistent with other intended purposes.
- Provide protection against scour erosion within the floodplain.
- Restore natural riparian plant communities.
- Moderate winter temperatures to reduce freezing of aquatic over-wintering habitats.
- To increase carbon storage.

CONDITIONS WHERE PRACTICE APPLIES

On areas adjacent to permanent or intermittent streams, lakes, ponds, wetlands and areas with ground water recharge that are capable of supporting woody vegetation.

CRITERIA

General Criteria Applicable To All Purposes

The location, layout and density of the riparian forest buffer will accomplish the intended purpose and function.

Dominant vegetation will consist of existing, naturally regenerated, or planted trees and shrubs suited to the site and the intended purpose.

All buffers will consist of a Zone 1 that begins at the normal water line, or at the top of the bank, and extends a minimum distance of 15 feet, measured horizontally on a line perpendicular to the water body.

Occasional removal of some tree and shrub products such as high value trees is permitted in Zone 1 provided the intended purpose is not compromised by the loss of vegetation or harvesting disturbance and state or local regulations allow the practice.

Necessary site preparation and planting shall be done at a time and manner to insure survival and growth of selected species.

Only viable, high-quality and adapted planting stock will be used.

Site preparation shall be sufficient for establishment and growth of selected species and is done in a manner that does not compromise the intended purpose.

Plantings will consist of two or more species with individual plants suited to the drainage condition of individual planting sites. Plant type and species shall be selected based on their compatibility in growth rates and shade tolerance. Select species that are common to

the area and existing riparian zones or from a variety of plant lists, such as Table 1, located in Appendix A.

An adequate upstream or adjacent seed source must be present when using natural regeneration to establish a buffer.

Livestock shall be controlled or excluded as necessary to achieve and maintain the intended purpose.

Harmful pests present on the site will be controlled or eliminated as necessary to achieve and maintain the intended purpose.

For optimal carbon storage, select plant species that are adapted to the site to assure strong health and vigor and plant the full stocking rate for the site.

Comply with applicable federal, state and local laws and regulations during the installation, operation (including harvesting activities) and maintenance of this practice.

Additional Criteria To Reduce Excess Amounts of Sediment, Organic Material, Nutrients and Pesticides in Surface Runoff and Reduce Excess Nutrients and Other Chemicals in Shallow Ground Water Flow

An additional strip or area of land, Zone 2, will begin at the edge and up-gradient of Zone 1 and extend a minimum distance of 20 feet, measured horizontally on a line perpendicular to the water body. The minimum combined width of Zones 1 and 2 will be 100 feet or 30 percent of the flood plain whichever is less, but not less than 35 feet.

Criteria for Zone 1 shall apply to Zone 2 except that removal of products such as timber, fiber, nuts, fruit and forbs is permitted and encouraged on a periodic and regular basis provided the intended purpose is not compromised by loss of vegetation or harvesting disturbance.

Zone 2 will be expanded in high nutrient, sediment, and animal waste application areas, where the contributing area is not adequately treated or where an additional level of protection is desired.

A Zone 3 shall be added to the riparian buffer when adjacent to cropland or other sparsely

vegetated or highly erosive areas to filter sediment, address concentrated flow erosion, and maintain sheet flow. The Filter Strip standard (practice code 393) shall be used to design Zone 3.

Concentrated flow erosion, excessive sheet and rill erosion or mass soil movement shall be controlled in Zone 3 prior to establishment of the lower riparian forest buffer zones.

Additional Criteria To Provide Habitat For Aquatic Organisms And Terrestrial Wildlife

Width of Zone 1 and/or Zone 2 will be expanded to meet the minimum requirements of the wildlife or aquatic species and associated communities of concern.

Establish plant communities that address the target wildlife needs and existing resources in the watershed.

Buffers shall be established or maintained on south and west sides of water courses and bodies insofar as practical. The buffer canopy shall be established to achieve at least 50 percent crown cover with average canopy heights equal to or greater than the width of the watercourse.

For intermittent watercourses, the buffer should shade 85 percent of the area within 35 feet of the watercourse. (Note: Buffers for the smallest of intermittent streams may consist of shrubs).

CONSIDERATIONS

The severity of bank erosion, concentrated flow erosion or mass soil movement and its influence on existing or potential riparian trees and shrubs should be assessed. Watershed-level or contributing area treatment or bank stability activities may be needed before establishing a riparian forest buffer.

When concentrated flow erosion and sedimentation cannot be controlled vegetatively, consider structural or mechanical treatments.

Favor tree and shrub species that are native, non-invasive, or have multiple values such as those suited for timber, biomass, nuts, fruit, browse, nesting, aesthetics and tolerance to locally used herbicides.

Tree and shrub species, which may be alternate hosts to undesirable pests, should be avoided. Species diversity should be considered to avoid loss of function due to species-specific pests.

Favor tree and shrub species that are native, non-invasive, and/or have multiple values such as those suited for timber, biomass, nuts, fruit, browse, nesting, aesthetics, and tolerance to locally used herbicides. Consider species that re-sprout when establishing new rows nearest to water courses or bodies. For detritus and large woody debris, use species that will meet the specific requirements of fish and other aquatic organisms for food, habitat, migration, and spawning.

Plants that deplete ground water should be used with caution in water-deficit areas.

Allelopathic impacts of plants should be considered.

The location, layout and density of the buffer should complement natural features, and mimic natural riparian forests. Avoid layouts and locations that would concentrate flood flows or return flows.

Consider the type of human use (rural, suburban, urban) and the aesthetic, social and safety aspects of the area to determine the vegetation selection, arrangement and management. For example, avoiding shrubs that block views and pruning low tree branches near recreation trails allows for ease of patrolling.

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

The following actions shall be carried out to insure that this practice functions as intended throughout its expected life.

The riparian forest buffer will be inspected periodically and protected from adverse impacts such as excessive vehicular and pedestrian traffic, pest infestations, pesticides, livestock or wildlife damage and fire.

Replacement of dead trees or shrubs and control of undesirable vegetative competition will be continued until the buffer is, or will progress to, a fully functional condition.

As applicable, control of concentrated flow erosion and sediment deposition shall be controlled by an adjacent filter strip.

Any removals of tree and shrub products shall be conducted in a manner that maintains the intended purpose.

Any use of fertilizers, pesticides and other chemicals to assure buffer function shall not compromise the intended purpose.

Any additional operation and maintenance requirements shall be developed on a site-specific basis to assure performance of the practice as intended.

Riparian Forest Buffer - NH Supplement

Code 391

GENERAL INFORMATION

Procedures, technical details and other information listed below provide additional guidance for carrying out selected components of the named practice.

PLANTED RIPARIAN BUFFERS

Planting Densities

Initial plant-to-plant densities for trees and shrubs will depend on their potential height at 20 years of age. Heights may be estimated based on :

1. Performance of the individual species (or comparable species) in nearby areas on similar sites, or
2. Table 1 - Tree and Shrub Species for Riparian Areas, specifications for tree heights 20 years after planting.

Plant to Plant Spacing		
Plant Types & Heights:	Plants per Acre	Spacing in Feet
Shrubs less than 10 feet in height	1200 to 4500	3 to 6
Shrubs and trees from 10 to 25 feet in height	450 to 1500	5 to 10
Trees greater than 25 feet in height	200 to 1200	6 to 15

When establishing a planted buffer, a minimum of two rows of trees and one row of shrubs should be established alongside the water body for maximum shade, stabilization and nutrient uptake within the desired buffer width. The remaining area should be planted to meet natural regeneration requirements.

Plantings can be intermixed with open areas treated for natural regeneration and specific

wildlife needs. These openings should not exceed 4,356 square feet (1/10 acres) in area. Open areas should not exceed 25% of the remaining planned riparian zone.

NATURAL REGENERATING OR DIRECT SEEDED RIPARIAN BUFFERS

Establishment Densities

A naturally regenerated riparian buffer is considered initially established when plant densities have reached the planted buffer recommended densities for trees and shrubs. A three growing season period is a reasonable amount of time in which to determine if natural regeneration would take place and be initially established.

Trees and shrubs are considered established when they begin to dominate herbaceous plants and undesired shrubs that are competing with it for nutrients, water and sunlight.

All areas immediately adjacent to the watercourse should have trees and/or shrubs growing near it. Open areas within the area designed as a buffer should not exceed 1/10th acre in size and should not exceed more than 25% of the total designated buffer area.

Preparation of Planting and Natural Regeneration Sites

Planting sites shall be properly prepared based on the soil type and vegetative conditions listed in Forest Site Preparation, Practice Code 490. For sites to be tilled, leave a 3 feet wide untreated strip at the edge of the bank or shoreline. Avoid sites that have had recent application of pesticides harmful to woody species to be planted.

Fabric mulch may be used for weed control and moisture conservation for new plantings on all sites, particularly those with pronounced growing season moisture deficits or invasive, weedy species.

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Buffer Width Benefits

Even minimum buffer widths provide some benefits to the stream ecosystem. In most instances additional width in excess of basic minimums provides less benefits for specific concerns the further the distance from the stream of water body. It is best to base buffer widths on a large array of concerns, including social and economic needs of the landowner as well as other non-water quality related concerns.

Range of Minimum Widths for Meeting Specific Buffer Objectives (Palone & Todd)	
Concern	Range of Widths (ft)
Wildlife	15 - 600
Flood Control	100 - 200
Sediment Control	50 - 200
Water Temperature	5 - 75
Streambank Stabilization	15 - 60
Nutrient Removal	50 - 200

The buffer width guide for selected wildlife species includes the sum of buffer widths on one or both sides of the water course or water body and may extend beyond riparian boundaries.

Buffer Width Guide for Selected Wildlife Species	
Species	Desired Width (ft)
Bald Eagle, cavity nesting ducks, heron rookery, sandhill crane	600
Common Loon, Pileated Woodpecker	450
Beaver, Dabbling Ducks, Mink, Salmonids	300
Deer	200
Lesser Scaup, Harlequin Duck	165
Frog, Salamander	100

PLANT LIST

Table 1 lists woody plant species (tree and shrubs) commonly associated with and suited to riparian areas. Key attributes are listed for each plant to assist with the design process for establishing new buffers. In most instances selection of tree and shrub species to be used can be determined by evaluating existing areas that have some of the same characteristics of the site being re-established.

The following is an explanation of the terms used in Table 1:

1. Shade Tolerance The plant's capacity to grow in a shaded condition. H = can grow in the shade of an overstory; M = can grow in partial shade; L = needs full or nearly full sunlight.
2. Shade Value The density or fullness of shade provided by an individual plant's crown in a full leaf-out condition. H = provides full shade; M = a partially open crown that provides patchy or incomplete shade; L = a very open crown that provides little shade.
3. Nutrient Uptake The plant's general capacity to use excess nutrients such as nitrate-nitrogen. H = can use large amounts; M = some excess nutrients used; L = plant is a low-nutrient user.
4. Inundation Tolerance General capacity of the plant to withstand standing water, low soil aeration conditions. H = can tolerate 10 or more days of inundation; M = can tolerate 2 - 10 day events; L = can tolerate 1 day or less of inundation.
5. Soil Saturation Tolerance The plant's capability to grow near or in saturated soil conditions. H = plant can withstand "wet feet"; M = some tolerance to saturated conditions; L = little or no tolerance to saturated soil.
6. Drought Tolerance The plant's capability to grow in droughty or dry soil conditions. H = plant can withstand or has physiology to survive droughty periods; M = some tolerance to drought or dry conditions; L = little or no tolerance to dry soil conditions.
7. Aesthetics A very general rating (H, M, or L) that indicates some aspect of the plant, e.g., flowers, special foliage characteristics, or plant part color, that enhances the appeal or viewing of the planting.

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8. Native Species "Y" indicates the plant is native to the state; "N" indicates it is introduced
9. Sediment Deposition Tolerance H = plant can withstand repeated, deep deposits of sediment; M = plant can withstand repeated, shallow deposits of sediment; L = plant can withstand little or no sediment deposits.
10. Special Notes (H) Trees have the ability to grow out over the water to catch sunlight. This

increases leaf litter and insects fall into the water. (L) Trees have columnar form, with few branches thus being ideal candidates for natural large woody debris when tree naturally falls into the water. (R) Trees or shrubs exhibit ability to root from cuttings or natural limb layering. (W) Trees provide either Wildlife cover or forage.

Table 1 - Tree and Shrub Species for Riparian Areas

Common and Scientific Names	Height at Age		TOTAL HEIGHT	1. Shade Tolerance	2. Shade Value	3. Nutrient Uptake	4. Inundation Tolerance	5. Soil Saturation Tolerance	6. Drought Tolerance	7. Aesthetics	8. Native Species	9. Sediment Deposition Tolerance	10. Special Notes
	10	20											
Tree (Conifer)													
White Pine (<i>Pinus strobus</i>)	10	24	100	M	M	M	M	M	M	M	Y	M	L
Hemlock (<i>Tsuga canadensis</i>)	8	20	70	M	H	M	L	L	H	H	Y	L	L/H
White Spruce (<i>Picea glauca</i>)	8	22	80	M	L	M	M	M	H	M	Y	L	
Black Spruce (<i>Picea mariana</i>)	8	22	70	M	L	M	H	H	M	M	Y	M	
Tamarack (<i>Larix laricina</i>)	10	32	60	L	L	M	M	M	L	H	Y	L	L
Northern White Cedar (<i>Thuja occ</i>)	6	18	60	M	M	M	M	M	M	H	Y	H	H/R
Tree (Deciduous)													
Red Maple (<i>Acer rubrum</i>)	10	25	60	H	H	M	M	M	M	H	Y	M	
Black Willow (<i>Salix nigra</i>)	12	30	60	H	M	L	H	H	L	L	Y	H	R
Bass Wood (<i>Tilia Americana</i>)	18	26	70	H	M	H	M	M	L	M	Y	M	
Grey Birch (<i>Betula populifolia</i>)	15	25	30	L	L	L	L	M	M	L	Y	L	
White Birch (<i>Betula papyrifera</i>)	15	34	70	L	L	L	L	L	M	H	Y	L	
White Ash (<i>Fraxinus americana</i>)	18	36	70	L	L	M	L	L	M	M	Y	L	
Black Ash (<i>Fraxinus nigra</i>)	16	30	60	L	L	M	H	M	L	L	Y	M	
Shrub													
Speckled Alder (<i>Alnus rugosa</i>)	6	12	20	M	M	M	M	H	M	L	Y	H	
Red Osier Dogwood	6	15	15	L	L	M	M/H	H	M	H	Y	H	
Alternate-leaf Dogwood (<i>Cornus alternifolia</i>)	6	15	20	M	L	M	M	H	M	M	Y	H	
Pussy Willow (<i>Salix bicolor</i>)	6	12	12	M	L	M	H	H	M	M	Y	H	R
Nannyberry (<i>Viburnum lentago</i>)	5	9	30	M	M	M	M	M	M	M	Y	H	W
Witch Hazel (<i>Hamamelis virginiana</i>)	6	18	20	M	L	M	M	M	M	H	Y	M	W
Streamco willow	6	8	12	M	L	M	M	M	M	M	N	H	R
Bankers Willow	6	8	12	M	L	M	M	M	M	M	N	H	R